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To cite this article: Catherine Coveney, Simon J. Williams & Jonathan Gabe (2019): Enhancement imaginaries: exploring public understandings of pharmaceutical cognitive enhancing drugs, *Drugs: Education, Prevention and Policy*, DOI: [10.1080/09687637.2019.1593318](https://doi.org/10.1080/09687637.2019.1593318)

To link to this article: <https://doi.org/10.1080/09687637.2019.1593318>



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Published online: 07 May 2019.



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Enhancement imaginaries: exploring public understandings of pharmaceutical cognitive enhancing drugs

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ABSTRACT

The growing use of psychoactive substances in everyday life, the increasing experimentation among users and the potential of poly drug use for non-medical, lifestyle or enhancement purposes presents an evolving policy challenge. The paper aims to build on previous research to gain a more in-depth qualitative understanding of the imaginaries around pharmaceutical cognitive enhancement (PCE). It focuses in particular on how the so-called pharmaceutical cognitive enhancing drugs (PCEDs) might be used and the social acceptability of these uses across multiple social contexts and groups. Data come from 23 focus groups (99 participants), representing a wide range of social groups, recruited in the UK. We discuss four distinct 'enhancement practices' where PCE use was conceptualised as a way to (1) become the best version of oneself; (2) gain a competitive edge over others; (3) for personal achievement or well-being; and (4) promote personal/public safety. The findings problematise the term 'enhancement' by showing the different ways in which the use of pharmaceutical 'enhancement' drugs can be imagined and understood. We argue for the value of policy responses that acknowledge and respond to a wider range of enhancement practices including those of prospective user groups.

ARTICLE HISTORY

Received 18 April 2018
Revised 2 March 2019
Accepted 5 March 2019

KEYWORDS

Pharmaceutical cognitive enhancement; qualitative research; UK; users-view; imaginaries

Introduction

Pharmaceutical enhancement drugs (PCEDs)

The term 'cognition enhancing drug' can refer to a wide range of substances, from prescription medications to caffeine to illegal drugs. The majority of drugs we have come to think of as potential 'cognitive enhancers' are readily available across the world as licenced medicines, their use controlled by prescription for particular medical indications. The term PCED provides a narrower focus and is usually used to refer to these prescription medications.

Typically, studies have focussed on a small number of prescription drugs such as methylphenidate (e.g. Ritalin, Concerta), modafinil and amphetamine type drugs that have the potential to be used outside of their licenced indications to augment cognitive functions (e.g. Schelle et al., 2015).

Methylphenidate is widely prescribed for people diagnosed with attention deficit/hyperactivity disorder and has been studied in healthy populations as a means of improving cognitive performance (Jansen, 2017). Modafinil is a wakefulness promoting drug that is prescribed to promote alertness in those with sleep disorders involving excessive sleepiness (such as narcolepsy) and can be prescribed off-label to people with Chronic Fatigue Syndrome, cancer and Parkinson's disease. It has been shown to provide a variety of other

moderate cognitive benefits in those without illness, including improved concentration, memory and motivation (Muller et al., 2013). Other less frequently studied drugs include Atomoxetine – a drug that is licenced in the UK for the management of ADHD to improve alertness, attention and focus, but has significant cardiotoxic effects, Donepezil which is prescribed to patients with Alzheimer's disease to improve attention, memory and social interaction (Dodou & Nazar, 2013), rivastigmine and beta blockers (Schelle et al., 2015).

However, the number of potential PCEDs could far exceed this. For instance, in late 2014, the UK Medicines and Healthcare products Regulatory Agency (MHRA) issued a press release announcing the seizure of over 20,000 units of 13 different types of cognition enhancing drugs, including unlicensed substances that had not been tested in humans. The press release claims that this event in and of itself illustrates the 'burgeoning demand and variety of new active substances entering the marketplace' and highlights concerns around 'the increasing experimentation amongst users' (MHRA, 2014).

The availability of PCEDs has led to much debate and speculation that there will be a significant lifestyle or recreational market for these substances in all areas of social life. As is alluded to in the MHRA statement above, the potential use of psychoactive substances for enhancement purposes, the increasing experimentation among users and the

potential of poly drug use for enhancement purposes present evolving policy challenges. This in turn is part and parcel of wider debates on the problems and promises of human enhancement today. For example, some are of a more 'precautionary' persuasion while others stress more 'proactionary' principles and imperatives which embrace risk taking. Then there are more collective and democratic issues of social justice and social welfare which these debates raise (see, for example, Lipinska & Fuller, 2014).

Enhancement imaginaries in UK research, media and policy

However, as is often the case for new and emerging uses of technology, in this case, pharmaceuticals as *biomedical technology*, little is known about the prospective and/or actual user populations. In such cases, societal and policy responses can often come to rest on imaginaries of drug use, imaginings of users and assumptions about their desires, motivations and experiences (Outram, 2011). Social imaginaries can be defined as a collective set of beliefs, shared understandings or expectations that exist amongst a (historically or geographically) distinct group of people (Taylor, 2004). Steger (2014: 25) argues that social imaginaries are 'macro-mappings of social and political space through which we perceive, judge, and act in the world' and thus can set the parameters within which we understand ourselves, our actions and our collective sense of their legitimacy. Imaginaries are not fixed, but flexible and open to new configurations.

In relation to new and emerging technologies, such as PCEDs, the ways in which prospective users, their motivations for use and effects of drug use are imagined is often through bioethical or neuroethical discourses and debates (De Vries, 2007; Greely et al., 2008; Harris, 2011) where the deployment of such ethical expertise becomes the mechanism through which public concerns are both raised and adjudicated (Rose, 2009; Martin, Pickersgill, Coveney, & Williams, 2011). Together, these stories, images and understandings craft a particular version of cognitive enhancement and enhancement drug use that infiltrates popular consciousness and recirculates in other arenas such as research agendas, policy and regulatory responses, and media discourses.

Dominant 'social imaginaries' (Taylor, 2004) of PCED use depict users as knowledge workers (including professionals and students) and those in safety critical occupations – such as military personnel, fire-fighters and medical professionals (Coveney, 2011). Their motivations for use are configured in terms of the 'improvement' or 'enhancement' of cognitive capabilities in a way that benefits workplace performance. We can see this clearly in media coverage of cognitive enhancing drugs, with for example, claims that we are in the midst of a so-called 'smart drugs epidemic' where 'up to 1 in 12 people' are now said to take smart drugs, due to pressure to perform at work and at University (The Telegraph, 2018). The drugs, we are told, are being used by those striving for higher levels of performance, to help them work longer hours, to excel in the workplace, to earn more money and get higher grades (The Tab, 2014; BBC News 2018).

In relation to drug policy, social imaginaries can be viewed as organising principles around which particular policy responses are structured. Imagined users are embedded within these sociotechnical imaginaries, and these conceptualisations can be used to define and support particular policy regimens (Cherry, Hopfe, MacGillivray, & Pidgeon, 2017). For example, we can see this in relation to the way in which modafinil is regulated. In 2010, the European Medicines Agency advised that the availability of modafinil should be more restricted and only prescribed for narcolepsy, citing its potential to be abused by students as one reason for these tighter controls (EMA, 2010). These regulatory changes came about despite modafinil being considered a relatively safe drug and limited empirical evidence that students were actually using modafinil as a study to any great extent at that time.

It is also these groups who have dominated most research efforts to understand PCED use. A significant proportion of research in this field has used surveys to focus on the motivations and practices of students or young adults, to the relative exclusion of other social groups. Often these surveys provide pre-defined options for participants to select regarding their motivations for PCED use, preconfiguring the answers that they are likely to provide and arguably reproducing dominant enhancement imaginaries (e.g. PCEDs are/will be ab/used by students in their attempts to get better grades) that circulate in academic literature, policy discourse and popular media.

There are only a small number of qualitative studies focusing on perceptions and practices of cognitive enhancement across different social groups as understood and defined by different types of user – be that actual, prospective or non-users (e.g. Coveney, 2011; LeClair, Kelly, Pawson, Wells, & Parsons, 2015; Petersen, Nørgaard, & Traulsen, 2015; Vrecko, 2015). Recent work in this area acknowledges the increasing centrality of pharmaceuticals in everyday self-management practices (Lopes, Clamote, Raposo, Pegado, & Rodrigues, 2015) showing how PCEDs are often used strategically and instrumentally, by specific user groups whilst being rejected by others (Sattler, Mehlkop, Graeff, & Sauer, 2014). Collectively these qualitative studies reveal that the ways in which such technologies come to be positioned, accepted, used or rejected in daily life can be very different from the ways in which these same technologies are imagined and discussed in bioethical and biomedical discourses (Pickersgill & Hogle, 2015). This research has begun to unravel the 'pharmaceutical regimens' (Williams, Martin, & Gabe, 2011) cognitive enhancing drugs are part of; the social context within which they are developed, regulated and accessed and the purpose and motivations for their use.

Presently, contemporary UK drug policy is focussed on strategies to restrict the supply of drugs and limit associated criminal activity (HM Government, 2017). There is very little drug policy at the national level specifically aimed at the use of PCEDs. While it is not illegal to possess these substances, sale or supply of a prescription only or unlicensed medicine is a criminal offence in the UK (MHRA, 2014). At the local level, PCED use remains a largely unregulated practice. Even in Universities in the UK, where much of the debate on the

so-called 'smart' drugs has tended to focus, information and policies on PCEDs tends, with few exceptions, to be somewhat limited. If present, information is provided together with advice on other drugs, and out of step with these wider debates, including indeed a recent NUS report on these very matters which calls for a less punitive and more proportionate approach to these issues given their complexities (National Union of Students, 2018).

As 'enhancement' drugs continue to be developed and their use allegedly proliferates both within the clinical encounter and beyond, important questions are raised around drug policy, including what appropriate policy responses should be at national and local levels, and the extent to which drug policies should attempt to control, or even promote the use of PCEDs in particular scenarios (Greely et al., 2008; Sugden et al., 2012).

In his recent paper, Erler (2017) focuses his attention on the utility of upholding a therapy-enhancement distinction (TED) as a guide to public policy. He argues that while there may be some use in maintaining a TED, it cannot perform the role expected of it; that is to say what is worthy, acceptable or justifiable in terms of resource allocation. The TED assumes that therapy is for medical need and can be justified, morally and financially, whereas the goal of enhancement is more frivolous, and based on want or preference rather than need. The assumption being that a pharmaceutical used as an enhancement is not useful or does not yield benefits for society more widely.

However, in academic circles at least, the blurredness of the boundaries between what we perceive as being a necessary medical treatment (or therapy) or an enhancement, and where we draw the lines between health and illness and dis/ability, are well recognised, including their socially constructed, historically shifting and contextually dependent nature (Conrad, 2007). This prompts a need for more scholarly engagement with issues around enhancement than there has been to date. How one defines 'enhancement', what is included or excluded here, what enhancement involves and the gains as well as losses entailed, for both individuals and society, are pertinent sociological questions.

Our aim in this paper is to build on previous research to gain a more in-depth understanding of how 'enhancement imaginaries' – defined as collective sets of beliefs, shared understandings and expectations about enhancement (Steger, 2012; Taylor, 2004) – that circulate in policy, research, public discourse and the media, are drawn on, reproduced, developed and/or dismissed by various publics in the ways they make sense of cognitive enhancement and evaluate the acceptability of PCED use across multiple contexts and groups. We end by offering some reflections on future policy responses.

Materials and methods

Data were collected as part of a wider project exploring medicated sleep and wakefulness in Britain (full details redacted). We held 23 focus groups (99 participants) with a

variety of stakeholders who might be expected to have differing views on the use of modafinil (see Table 1) based on their age, occupational role and health status. Thirteen of the participants had experience of using modafinil, methylphenidate, amphetamine or other stimulants. All disclosed use was in the context of treating diagnosed medical conditions. None of our participants disclosed experience of non-medical or recreational use of stimulants. Focus groups were held between 2011 and 2013.

Participants were aged 18–85+ years old with approximately half of the sample 45 years of age or over. Around 60 per cent of participants were female and around 90 per cent identified as of white British or Irish ethnicity. Just over half the sample had, or had previously had before retirement, a higher managerial or professional job (more information about sampling and recruitment can be found in Gabe, Coveney, & Williams, 2016).

Focus groups were used as the means of data collection in order to explore people's views about, and experiences of pharmaceutical use across different medical and non-medical contexts. This included discussion of different medications that induce sleep (e.g. hypnotics) and medications that can promote wakefulness or improve alertness (e.g. stimulants). The focus group discussion was facilitated by a series of simple vignettes depicting different types of drug use that might be considered to blur the therapy/enhancement boundary (Table 2). Within this, participants were introduced to the drug modafinil and asked to discuss some of its prospective uses. Discussions were widened to include other potentially enhancing prescription medications, over the counter medications and recreational drugs where the participants had knowledge or experience of these substances.

Focus groups can be distinguished from one-to-one interviews as during a focus group participants are encouraged to engage with one another and this interaction between participants becomes a focus of analysis (Kitzinger, 1994). Using focus groups as a research tool and eliciting conversations about PCEDs enabled us to: explore how people imagined and evaluated PCE and to assess how ideas are formed and decisions are made regarding the 'appropriate' role of these pharmaceuticals across different contexts. This methodology not only generates data about what people think about a certain issue but also draws out the moral dimensions of how they think about it and why they think as they do.

Focus groups were audio recorded and transcribed. Analysis of the transcripts was facilitated using the qualitative data analysis software package NVivo 10 (QSR International, Brisbane, UK). We took an inductive and interpretative approach to data analysis which involved reading and re-reading the transcripts, developing a coding frame based on major topics and issues and grouping data extracts together into codes, and connecting congruent codes together to generate themes. Codes and themes relating to major issues were discussed between the authors for purposes of reliability and validity.

Theoretically our analysis draws on the social science notion of social imaginaries, as already discussed above, with particular reference to 'enhancement imaginaries' as one specific type of social imaginary. We will show how the idea of

Table 1. Focus group demographic characteristics.

Focus groups	Number of participants	Gender (M/F)	Age range	Ethnicity	Employment level
Academics 2 groups (AFG1–2)	8	5M 3F	25–54	7 WB/Irish 1 mixed (White & Asian)	Higher Managerial & Professionals
Ambulance Service Staff 3 groups (ASFG1 –3)	9	5M 4F	25–54	9 WB/Irish	Higher Managerial & Professionals
Lawyers 1 group (LFG1)	3	2F 1M	35–44	2 WB/Irish 1 White (other)	Higher Managerial & Professionals
Narcolepsy Patients 2 groups (NFG1 –2)	13	7F 6M	18–74	12 WB/Irish 1 BB (African)	5 Intermediate 4 Technical & Craft 1 Not disclosed 1 Unemployed 1 Student 1 Higher Managerial & Professionals
Parents of Young Children 2 groups (PFG1 –2)	10	6F 4M	25–44	8 WB/Irish 1 Asian or AB (Pakistani) 1 White (other)	6 Higher Managerial & Professionals 3 Intermediate 1 Technical & Craft
Primary Care Patients 3 groups (PCFG1 –3)	12	6F 6M	45 to 85+	12 WB/Irish	6 Higher Managerial & Professionals 1 Intermediate 3 Technical & Craft 2 Not disclosed
Retirement Complex 3 groups (RFG1 –3)	15	14F 1M	65 to 85+	15 WB/Irish	9 Higher Managerial & Professionals 3 Intermediate 3 Technical & Craft
Sleep Apnoea Patients 3 groups (SAFG1 –3)	13	8M 5F	45–74	13 WB/Irish	10 Higher Managerial & Professionals 1 Intermediate 2 Technical & Craft
Students 4 groups (SFG1 –4)	16	11F 5M	18–44	10 WB/Irish 2 White (other) 1 Mixed (other) 1 Asian 2 Chinese	Students
Totals	99	41M 58F	18–24 (15) 25–34 (18) 35–44 (15) 45–54 (14) 55–64 (10) 65–74 (11) 75–84 (12) 85+ (3) Not disclosed (1)	88 WB/Irish 4 White (Other) 2 Chinese 1 Black British 2 Asian/Asian British 2 Mixed	52 Higher Managerial & Professionals 14 Intermediate Occupations 12 Technical & Craft 17 Students 1 Unemployed 3 Not disclosed

Table 2. Vignettes.

Vignettes	Key themes picked out for discussion
1. Tom was referred to a specialist sleep clinic where he was diagnosed with narcolepsy. His doctor has prescribed him modafinil to help him stay awake and feel more alert during the daytime	Medical use of modafinil
2. Connie is 74 and lives in a residential care home. Her doctor has prescribed her sleeping pills to help her sleep through the night. She also takes wake-promoting pills her daughter bought for her on the Internet to boost her levels of daytime alertness and cognitive functioning	Non-prescription use of modafinil, older population
3. Jen is a student. She uses modafinil and finds that she is able to stay awake longer and concentrate better on her work when she takes the pills	Using modafinil to study
4. Nina is a palliative care nurse. Sometimes she uses sleeping pills to help her sleep in the daytime. If she is struggling to stay awake at work she occasionally takes wake-promoting pills to boost her levels of alertness	Workplace use of sleep and alertness drugs; safety critical occupational context
5. Jamal works as a marketing director for a large multi-national company. He frequently uses wake-promoting pills at the beginning of day and after international travel to improve his levels alertness. He also finds that they help him to concentrate better, absorb information and make important decisions more quickly	Workplace use of modafinil, knowledge worker

PCE and the availability of PCEDs have given rise to a number of ‘enhancement imaginaries’ in the public domain that align and/or differ in various ways to the dominant enhancement imaginaries that circulate in contemporary academic, policy and media discourses.

Results

Through our analysis of the focus group data we generated key themes corresponding to four different ‘enhancement imaginaries’, primarily demarcated by the ways in which the

goal of ‘enhancement’ was conceptualised, PCEDs were configured, and the users imagined. These related to enhancement (i) to perform at ones best, (ii) gain a competitive edge over others, (iii) for personal achievement or well-being, and (iv) to promote safety of self and others. It is to these key themes that we now turn.

Pharmaceutical ‘fixes’ to perform at ones best

Within this enhancement imaginary PCEDs were typically considered to be pharmaceutical ‘fixes’, with the use

conceptualised as a form of self-medication to 'repair' a perceived problem of underperformance and hence to 'restore' performance at one's best (Conrad & Potter, 2004). Motivations for use were perceptions of underperformance connected to a health or social problem that would lead to a disadvantage if not remedied. Drug use in this imaginary was depicted as an individualised practice.

Participants across several of the focus groups imagined the use of PCEDs by people who might consider themselves to be underperforming or operating below their own optimal level, due to medical disorders (e.g. sleep disorders, allergies, cancer, dementia) or other lifestyle factors (e.g. stress, pressure, heavy workload, sleep deprivation, use of other substances that might impair cognition). Even though individuals in these situations might have obtained pharmaceuticals outside of medical authority with the explicit goal of improving their performance, PCED use in this type of scenario was generally regarded as a type of 'self-medication'. See for example, how the participants in an ambulance service focus group discuss the use of modafinil by students in an exam situation, reproducing, yet also recrafting a dominant enhancement imaginary of PCED use:

Male 2: When you've got people that may have something like hay fever and constantly feel as if they've got a cold and they took something like that, then we would probably say that was ok for them to do that.

Female 1: That's true because it's not like... you've still got to have the knowledge to be able to recall, haven't you, it's not like it's going to... take the pill and you're going to be able to solve complex equations. It's not going to give you an extra skill, is it?

Male 2: Anyone that's had hay fever feels quite gross and not at their best.

Moderator: So, it's for getting them up to their best?

Male 2: I suppose it's getting them back up to best as opposed to exceeding it which would be perceived as cheating in some ways. (Ambulance Service Focus group 1)

The use of PCEDs was imagined as having a broadly therapeutic goal, despite being potentially procured outside of a medical encounter. When PCEDs were configured as being medicine – like, motivations for use were imagined as a way to regain a normal or typical level of functioning (for that individual) and to enable the user to 'reach their potential', rather than 'enhance' cognitive capabilities beyond a previously attained level. Typically, this was viewed by our respondents as being a socially acceptable goal and a morally acceptable practice.

Participants questioned why those who consider themselves to be high achievers would want to take a pill to try and enhance their cognition if they were already functioning well or performing at a high level. When PCEDs were considered to be medicine-like, the idea of taking drugs to become 'better than well' did not seem to make much sense. In the data extract below, a medical student gives his view that medication is usually used in order to remedy a perceived problem or inadequacy:

Male 2: Most people who [study] medicine are actually quite driven [...] most people are Type A personality in my opinion so most of the time you don't need anything to motivate yourself

anymore [...] I would much rather drink alcohol than I would take anything that's going to improve my performance because I don't struggle with learning stuff. It's switching off which is the thing. I think you medicate the thing you're not so good at, potentially, which is the whole point of drugs, isn't it? (Student Focus Group 3)

To summarise, when PCED use was positioned as a form of 'self-medication practice', users were imagined as those who perceived themselves to be performing at a sub-optimal level, rather than people seeking to enhance performance beyond the norm. In these imaginaries we can see how drug use is made sense of as a means of remedying a perceived problem or inadequacy, with PCED use a way for individuals to become the best version of themselves. They are thus positioning the 'pharmaceuticalisation of performance' (Lopes et al., 2015) via PCEDs as an acute, short-term fix that would be unnecessary or redundant for those who were already able to perform at an adequate level, or with easy access to other substances and strategies for improving particular aspects of cognition (e.g. alertness).

This type of 'enhancement practice', although generally viewed as being a morally acceptable use of PCEDs, jars with current regulatory approaches to prospective PCEDs (e.g. modafinil) that prohibit use of these drugs outside of very specific clinically defined medical conditions. It also sits outside of the social imaginaries invoked in policy and ethical debates where enhancement drug use tends to be imagined as a way to improve performance beyond the norm, with those who are using drugs afforded cognitive gains that put them at advantage over others.

'Pharmaceutical enablers' to gain a competitive edge over others

Reproducing aspects of dominant social imaginaries around enhancement practices that circulate in research, policy and media, our participants talked about PCED use as a means to gain a competitive edge over others. PCEDs were typically configured here not so much as pharmaceutical fixes for underperformance but as 'pharmaceutical enablers' where motivations for the use were to enhance performance in order to gain a competitive edge over others. They imagined this being likely to occur primarily in two social contexts; the university and the workplace. Drug use in this imaginary was discussed as a social practice, having effects on and implications for others beyond the user.

Participants imagined the type of student who would turn to PCEDs in order to improve their performance; this was often the young, typically male student who would take anything on a short-term basis to 'power through' exams and revision without having adequate rest. This imaginary is illustrated in the extract from a student focus group. The moral consensus achieved through their discussion is clear:

Female 2: My observations of undergraduate men, there's a sort of macho mode of masculinities going on which is like yeah, we're just going to power on through and take these you know [...] you see it in the library, a very public drinking of these energy drinks and the caffeine pill packets, [...] And I can't be bothered with that really, I find that annoying [taking study drugs

is] probably a bit of a false economy, if you've got any more than one or two days to go on they're going to feel dreadful so I kind of think that it's a bit silly and an immature approach to studying.

Moderator: So what would you think about people that did use drugs to help them study?

Female 1: {...} If it enhances performance I think that for me is problematic.

Female 2: Like sports enhancement, like taking ... like cheating.

Female 3: Just like cheating.

Female 1: That is like cheating, yeah. (Student Focus Group 1)

There are very few real life situations where cognitive performance is quantified or measured. However, in one sense, academic performance can be seen as an exception here. Participants across all of our focus groups argued that if you could demonstrate that academic performance was being measurably improved in assessments by taking PCEDs, then use of the pharmaceutical in this context would give an unfair advantage to the user and could be considered as cheating.

In terms of taking enhancement drugs in the workplace, a particular type of worker was often imagined as a prospective user of PCEDs – a cognitive sector knowledge worker in a high pressured and competitive environment, whose job and performance at work was important to them, who needed to 'be on the ball' to perform and to make money. These people, it was assumed, want more out of life but are willing to put less in, and are willing to take short-cuts. The practice of PCE in this context was considered vain, selfish, greedy and taking the easy way out. As can be seen in the data extract taken from a sleep apnoea focus group, the Hollywood film 'Limitless' served as a convenient cultural script within which to articulate these ideas:

Male 2: The film Limitless, it's about this enhancing drug, but the guy keeps taking it because he suddenly realises that he can get on better at work and when he doesn't take it he doesn't do so well. And that's a similar sort of thing here. Where's the impetus to stop if actually your day-to-day living becomes better because of it?

Male 1: Well it's interesting you say better there, because I think one of the problems of modern life is that [...] we have to perform better all the time, instead of being able to actually work at a reasonable rate [...] I don't think your happiness ought to necessarily depend entirely on your work. And in a sense you work in order to have happiness with your friends and your family and so on. I've always felt that. (Sleep Apnoea Patients Focus Group 3)

Despite reproducing elements of dominant social imaginaries around enhancement in their discussions, participants did not accept these ideas uncritically. They often discussed which aspects of taking a PCED might actually be 'enhancing' across different social and occupational contexts. Thinking beyond the student or knowledge worker, the limits to cognitive enhancement were highlighted in terms of how important these 'enhanced' functions might be for performance/output in different social or occupational roles.

However, it was easy for participants to imagine a wider group of workers turning to enhancement drugs in the modern world. They discussed societal pressures such as heavy

workloads, balancing work and family life, stress and increasingly competitive work environments where people are put under pressure to succeed and to constantly perform better. A small number of the participants thought that enhancement drugs might be attractive to them and others like them in this respect, particularly in certain occupations where the search for a competitive edge is embedded in occupational culture (e.g. barristers, stock brokers). However, this type of PCED use was typically viewed as being morally dubious and there was a strong collective belief that it would be wrong for people to use PCEDs in order to seek an advantage over others. Participants expressed discomfort at the idea that people might feel they had to take PCEDs in order to perform at work – either to get ahead of others or just to keep up.

The idea that performance whilst under the influence of PCEDs would be both inauthentic and unappealing was often expressed. This can be seen in the exchange below in a Narcolepsy focus group:

Male 2: [...] If you have got two guys going for a job and one of them decides he is going to take modafinil or whatever while the other guy doesn't, the guy who's taken the Modafinil could potentially be sharper at interview or whatever but when it comes down to the crux and he gets into the job and he's not taking Modafinil now he has falsely represented what he is and what he is going to be and he will not achieve or maintain that optimum that he demonstrated at interview.

Female 1: [...] I don't try and make my body do more than what it can do because there are people who will just push and for me that's a kind of really nasty idea so I feel really happy to be with what I am, just with what I am now. So I wouldn't do any of this extra hours or anything like that, not with the help of medication. It just doesn't appeal. (Narcolepsy Patients, Focus group 2)

Doubts were frequently expressed regarding the power of a pill to provide this competitive edge and concerns raised regarding possible health and social impacts of this sort of drug use. Visions of a future society in which PCED use was prolific, resulting in more pressure and higher expectations of what people can realistically achieve were expressed. These were used to frame concerns about the possible health impacts of pushing oneself too hard and of social addiction, in relation to the ability for users to stop taking PCEDs when workplace pressures are unrelenting. Thus, within this imaginary of enhancement drug use, prohibitive drug policy that limits the availability of PCEDs in wider society was regarded as way to protect workers from coercion, exploitation and possible harms to health.

'Creative tools' for personal achievement or wellbeing

In contrast to imagining the use of PCEDs as a means to gain a competitive edge over others, and in contrast to the use of PCEDs where there is a perceived deficit or problem the drug is seen to be remedying, participants here drew on an enhancement imaginary where PCEDs could be used as a mean to boost productivity or cognitive performance in non-competitive situations. Here, PCEDs take the role of 'creative tools' that individuals can use to augment and modify themselves, as part of their private 'body projects' where there is

no perceived issue or problem with current functioning. The drug in this sense, in contrast to these previous two imagined uses, is not treating anything but becomes instead an individual, creative and experimental practice to alter bodies/minds/performance for individual reasons, goals, aspirations.

Typically, self-modification and personal achievement was regarded as being a socially acceptable motivation for seeking out the use of enhancement drugs within a generally liberal and individualistic frame. Understood in this way, participants imagined how PCEDs could have a range of different effects on their users meaning that 'enhancement' would manifest in different ways:

Male 1: [Enhancement drug use is] actually using whatever to take somebody to do their absolute best that they possibly can, which you could argue, 'is that actually a bad thing?' because we could, potentially, have lots of really fantastic people with lots of different things.

Male 2: But, taking that to an extreme we would all be [athlete's name] then so we would all be doing exactly the same time?

Male 1: No, because you've all got your own abilities, haven't you, so it's taking your personal ability to the [best it can possibly be]. (Ambulance service focus group 1)

As expressed in an academic focus group, the cognitive enhancing effects of the drug would be qualitatively meaningful in different ways across individual contexts. However, at the same time, participants questioned the utility of taking PCEDs to achieve a better quality of work. This can be seen in the quote below where the participant frames potential PCED use in an academic context in terms of individual achievement in completing an academic project, while expressing his doubts over whether the quality of academic work would actually be improved by pharmaceutically augmenting cognition:

Male 1: I don't take it. I don't know anyone who does take it. [...] I can see the analogy with sport, but I kind of think of the academic enterprise not as a competition [...] if some people use cognitive enhancing drugs in order to get a book written and that gets published, I think of it not as something which stops me from getting a book written and published without cognitive enhancing drugs. And I'm not entirely sure whether a book written under cognitive enhancing drugs would necessarily be any better [...] it might well be that this book is written in record time, but it maybe has a narrative briskness that maybe doesn't suit the subject. [...] So to that extent, I don't quite see it as the same as, say, you know, eight people on a track about to run the 100 metres. (Academic Focus Group 1)

It was frequently stated that academic work is not always about 'remembering the right answers' but instead about building thoughtful, considered and reasoned arguments. Working slowly and steadily over time was thought more beneficial than taking a drug to improve memory or concentration on a short-term basis. Overall, a high degree of scepticism was expressed across the data set that taking PCEDs would actually 'enhance' cognitive abilities in a way that translated to enabling a higher quality of work.

Imagining PCED use as an individual and creative practice enabled both the potential gains and losses associated with drug use to be evaluated by prospective users for both the individual and for wider society. In one sense, this

enhancement imaginary fits with the Transhumanist agenda – in that people should have the freedom to use technology to improve and enhance cognition, emotion, aesthetics and abilities, engaging in their individual 'body projects' in any way they chose. However, imagining PCED use in this way enabled participants to consider what effects these drugs might have in real world situations, how effects of the drug would likely vary between individuals and context of use and to question how meaningful or beneficial PCEDs would be across each of these contexts.

'Tools' for personal and/or public safety

Lastly we turn to an enhancement imaginary where PCEDs are configured as a type of 'safety tool' or technology. This was a lesser theme in the data, but still worthy of note due to its divergence from the other imagined enhancement imaginaries discussed above. Participants imagined people working in particular occupational roles that might benefit from using PCEDs in order to keep them and others around them safe. Military personnel, nurses, doctors, pilots and truck drivers were all discussed in this vein in a retired persons focus group.

Male 1: I think it's a health and safety issue. I can take an extreme case, for someone in a combat zone, in the armed forces, they may need modafinil because they're carrying out a life threatening, gruelling, prolonged assignment. [...] if it's life threatening, use it. (Retired persons, focus group 3)

When configuring PCEDs as 'safety tools', imagined drug use could be conceptualised as having social value in enabling those in safety critical occupations to perform safely, to help others and do 'positive work' for the benefit of others, as expressed in a narcolepsy focus group:

Moderator: You mentioned nursing where you felt that [modafinil use] was legitimate, why did you feel that?

Female 1: I don't know. Well it's just a more worthy sort of thing than a marketing director. She is doing positive work...for other people...

Female 2: It is not necessarily a choice to do shift work because obviously [...] hospitals don't shut so they have to have people working these shifts all the time to take care of people and like you are saying it is a more worthy cause, possibly but I'm not sure. She's doing good stuff. (Narcolepsy focus group 2)

Despite this, the ambulance service staff that participated in our study did not view these issues as applicable to their *own work experience*, where one may perhaps have expected it on safety critical grounds. Typically, PCED use was regarded as unnecessary in their occupational role as they were already able to manage the effects of cognitive decline and sleep deprivation in other ways. Moreover, as discussed in relation to the more individualistic enhancement practices outlined above, the effects of drug use on the health and wellbeing of an individual was raised as a concern. Participants discussed the potential side effects of drug use in these contexts, particularly in terms of fostering dependency and other possible effects on the body. Additionally, they considered how the effects of the drug might impact not only on the individual's cognitive performance, but also

on their ability to do their job and the quality of their work. As a case in point, when talking about the possibility of a nurse taking modafinil while working a night shift, participants in one academic focus group discussed the impacts that improved cognitive function might have on empathy or intuition. They recognised the possible benefits of improving alertness and concentration but argued that it takes more than this to be a good 'human nurse'. Thus, participants questioned the social value of improving certain aspects of cognitive performance and discussed whether potential cognitive enhancing effects of the drug (e.g. improving alert wakefulness) would necessarily translate into them being able to do their job better:

Male 2: The other thing is about how we're characterizing the nature of people who work there—we're assuming that it's a cognitive activity that you have to be wakeful for, but is it a purely cognitive activity? What effect does this drug have on the things like empathy and intuition? So it may, if you characterise the work in a purely productive, measurable way, look as if it's addressing risks, addressing concerns about safety, but I think we need more information about the drug to really understand its full effect. And also more information on the nature of work and this particular form of work to understand whether it's a good or bad thing and whether it enhances safety, enhances quality as well. It's not just about safety. You basically want somebody who's safe but you also want somebody who's good, a good and human nurse. Or safe and human nurse. (Academic Focus group 1)

Although the core aspect of this enhancement imaginary could be seen as instrumental (e.g. taking a drug to improve one's memory or alertness level), participants tended to evaluate the potential effects of this type of drug use in wider social and relational terms. Imagining PCEDs as a type of safety tool through which users seek 'customisation' (Williams, Coveney, & Gabe, 2013) of their cognitive abilities and functioning allowed drug use to be evaluated in terms of potential impacts on both the individual, their health and functioning and on others.

Discussion

Most research on pharmaceutical cognitive enhancement to date has focussed on the perceptions and practices of students or young adults, to the relative exclusion of other social groups. Our aim in this paper was to gain a better understanding of the social imaginaries around pharmaceutical cognitive enhancement, particularly around how people collectively imagine that PCEDs might be used by themselves and others like them, how motivations to engage or abstain from PCED use are imagined and shared understandings of the desirability and acceptability of these uses across multiple social contexts and groups.

As with any technological development, enhancement drugs can be 'flexibly interpreted' or understood and used in different ways by users in local contexts (Coveney, 2011). Our data illustrate how PCED use is not understood as simply a case of using pharmaceuticals as therapy (to treat illness) or enhancement (to reach otherwise unobtainable levels of performance or functioning). A range of 'enhancement practices' can be imagined and potentially enacted across different social and occupational contexts. Far from having 'stabilised',

moreover, these social imaginaries are themselves overlapping, with their own complexities and inconsistencies.

Participants frequently identified grey areas in which they questioned whether the use of drugs to improve performance could be considered as 'enhancement' or not, despite being obtained outside of clinical or medical advice and used to improve performance, in particular when taking cognitive enhancing drugs was conceptualised as a form of 'self-medication'. In this case, pharmaceutical use was not perceived as being motivated by an aspiration by the user to boost cognition above normal levels, and although being accessed and used outside of its clinical indications, this type of use was still considered to be therapeutic in many ways. The idea that pharmaceuticals may be used outside of the clinical domain as a means of self-medication is well-established in the existing literature around pharmaceutical cognitive enhancement (Coveney, 2011; Lopes et al., 2015). Such self-medication ties into contemporary bio-political ideas about health regarding increasing individualisation, self-management and self-regulation of body and performance in present-day societies (Rose, 2009). For this 'enhancement practice', optimisation (of one aspect of the self) might be a more applicable term that better describes perceived motivations for PCED use (Rose, 2009) where the pharmaceuticals in question are understood and positioned more as 'pharmaceutical fixes' for a (self-defined) problem rather than 'enhancers' (Martin et al., 2011).

Imagining PCED use as a way to improve performance in order to gain a competitive edge over others is one of the dominant social imaginaries circulating in academic, policy, regulatory and media discourses about pharmaceutical enhancement. Within this enhancement imaginary PCED use is typically framed as a form of prescription drug 'misuse or abuse' (Racine & Forlini, 2010). It shapes understandings of PCED in a particular way by focussing on cultural ideas of competition, fairness, productivity and 'authenticity', of drug abuse and harms to health. Thus, arguments for tight regulatory controls and the adoption of prohibitive drug policies tend to follow on from this as means to protect prospective users from exploitation or harm. Likewise, this type of enhancement practice was readily imagined during our focus group discussions. However, in our data, in this enhancement imaginary, drug use was positioned as an individual solution to a structural problem; with pharmaceuticals acting as 'enablers' as much as 'enhancers' in that they were regarded as functioning to enable individuals to continue to participate and perform in competitive environments where expectations exist for people to continually perform at a high level and constantly strive to do better. In this sense, PCEDs were regarded as a tool of modernity – a way to keep going and do more. Frequently, similarities were drawn between PCED use and existing 'performance consumptions' (Lopes et al., 2015) such as using caffeine and energy drinks as aids to promoting alertness, concentration and wakefulness.

Alternative enhancement practices were also imagined in which motivations for engaging in drug use were for personal achievement or to mitigate against safety risks. PCEDs were positioned as 'tools' at our disposal which we can use at an individual level to aid creativity or in a collective or relational context, as good citizens promoting workplace

safety. Underpinning both of these imaginaries was the idea that the qualitative effects of PCEDs would be variable between individuals and between contexts. Throughout, there was a high level of scepticism that a PCED would deliver meaningful effects, and provides substantial gains without losses.

One of the key themes that cuts across each of the enhancement practice we discuss above was that the way in which people understand and define 'enhancement' is highly subjective. In addition, what people might seek to 'enhance' by taking PCEDs differs between individuals and between contexts. There was a strong sense across the data that everyone has different abilities, strengths and weaknesses so taking enhancement drugs will reflect that. In taking these drugs, we would see a variation of effects between users. Also, this was the case in regard to the relative importance of what particular function or capacity was actually being improved or enhanced through drug use in relation to other aspects of the self. This finding bears similarity to other research on cognitive enhancement, which points to the significance of emotion and the effects of drug use on feelings of wellbeing, pleasure and enjoyment in enhancement practices (e.g. Petersen et al., 2015; Vrecko, 2013), signifying that there is an overemphasis on cognition in dominant bioethical and policy accounts of drug use of this type (Ketchum, 2013).

Context of use, imagined motivations for use and current drug policy all influence moral judgements around pharmaceutical use. Not all 'enhancement' practices were perceived to be morally equivalent. Respondents differentiated between using drugs to achieve ones best, for personal achievement or to help others (which were viewed as socially acceptable goals) with their use to get ahead, to gain an advantage over others in directly competitive situations or to make money (in ethically dubious ways). The perceived motivations for enhancement, in addition to the context in which pharmaceutical enhancements might be used, and who the users were imagined to be were important factors in judging the social/moral acceptability of pharmaceutical cognitive enhancement. In addition, the regulatory context within which PCEDs are obtained influences perceptions of safety and 'proper use' (Coveney, 2011).

We can see how enhancement is a 'slippery' term that can have multiple meanings. In turn, PCEDs can become slippery objects in policy debates, with different ways to conceptualise them, how they are being used and why. Thus, our data further questions the distinctions that one might make between medical and non-medical use of PCEDs and supports the idea that the TED does not capture the range of drug use, user motivations or experiences and therefore cannot perform the role expected of it in policy making; that is to say what is worthy, acceptable, or justifiable in terms of resource allocation (Coveney, 2011; Erler, 2017)

To summarise, we problematise the term 'enhancement' by showing the different ways in which it can be understood and what it means to people in the context of their daily lives. Further, we problematise assumed motivations for seeking enhancement in regard to these imagined enhancement practices. Using PCEDs is not all about enhancing cognition beyond the norm and not all non-clinical use is perceived to be non-therapeutic.

We argue for conceptualisation of PCE as multiple 'enhancement practices', that are at once material, embodied and discursive in nature, and are entangled with various imaginaries of the user and their motivations, desires, goals, aspirations, ambitions and expectations. Pharmaceuticals can be viewed as actors in these assemblages, taking on various roles as fixers, helpers, enablers, enhancers, creative and safety tools. Based on our data, we might also pause to reflect on whether calling these imagined uses of pharmaceuticals 'enhancement' practices is the most appropriate terminology to describe how people think about the many possible uses of such drugs outside of their use as prescription medicines for treating medically sanctioned clinical indications.

Implications for policy

How people think about and evaluate new technologies in the context of their daily lives is important for future policy. There is a need 'to understand the situations, pressures, and expectations that lead users to seek performance enhancement' (Ketchum, 2013:27) in order to understand how and why these drugs might come to be used, accepted, resisted or rejected across society and in and between different social groups.

The urgency of a new policy or regulatory response to PCED use is not clear. Evidence suggests that regulatory changes are not imperative; use is not particularly widespread at a population level in the UK and the enhancers currently available are not considered to be particularly effective (Ragan et al., 2013). However, considering that in the UK at least, a drug free/abstinent society is the dominant political, social and cultural imaginary, current regulatory approaches do not appear to be inhibiting the use of pharmaceutical cognitive enhancers as studies continually show that there is a small (albeit significant and growing) market for these substances.

Based on our findings we suggest that nuanced understandings of PCED use are emerging in particular social and cultural niches. Future drug policy and regulatory reviews could incorporate insights from wider 'enhancement imaginaries' to better reflect prospective uses across a broader range of contexts than those currently being imagined in policy debates. An integrative strategy that recognises the enhancement practices that prospective users envisage themselves and others like them engaging in may contribute towards more accurate assessments of the social implications of the proliferation of PCEDs and help in the development of better informed regulatory approaches. Returning to the wider policy debates on human enhancement discussed earlier – and without taking any normative stance on these matters ourselves – perhaps they might also consider the merits not simply of precautionary but *proactionary* (Lipinska & Fuller, 2014) approaches to these matters in the interests of more nuanced future policy responses which balance individual freedoms with collective and democratic issues of social justice and social welfare.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by Economic and Social Research Council [RES-062-23-2456].

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